

FLIGHT

First Aero Weekly in the World.

Founder and Editor: STANLEY SPOONER.

A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport.

OFFICIAL ORGAN OF THE ROYAL AERO CLUB OF THE UNITED KINGDOM.

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CONTENTS.

	PAGE
Editorial Comment:	
The Vortex Theory of Sustentation ...	187
A Two-Seater Nieuport Biplane ...	189
The Aeroplane in War—Past, Present and Future ...	191
Aircraft Work at the Front. Official Information ...	192
The British Air Services ...	192
Royal Aero Club. Official Notices ...	193
From the British Flying Grounds ...	194
Eddies. By "Æolus" ...	196
The Flying Machine: The Aerofoil in the Light of Theory and Experiment. By F. W. Lanchester, M.Inst.C.E. ...	198
Aircraft and the War ...	199
Models. Edited by V. E. Johnson, M.A. ...	201

With regard to photographs and descriptions of new British machines and those of our Allies, and other information which may be of help to our enemies, it should be noted that the Editor of FLIGHT, in the National interest, submits all matter of this character to the Official Press Censor before publication. Hence our readers will appreciate that many new departures in construction or advances in detail work are necessarily held back for the present rather than the smallest risk should be run of helping those who are so strenuously fighting the Allies for the enforcement of their "Kultured" militarism.—ED.

EDITORIAL COMMENT.

The Vortex Theory of Sustentation.

Last week we published the first instalment of Mr. Lanchester's paper entitled "The Aerofoil in the Light of Theory and Experiment," which is continued in our present issue. Although highly technical in places and calling for a wide and extensive knowledge of hydrodynamic theory, it is presented in such a form and with such explanatory observations, that the non-technical man can, if he diligently applies himself to the matters there dealt with, acquire a sound knowledge of the basis of the investigation upon which Mr. Lanchester is now and has for some time past been working. The dissemination of treatises of this character, which have entailed months and years of labour in their preparation, far more than appears upon the surface, is essential for the advancement of the science of Aeronautics; and it is by such means—the exchange of ideas, and the pub-

lication of the best work and considered theories of our great scientists—that Aviation as a whole must needs progress. That there should be such men as Lanchester who are prepared to devote their all too short leisure time to the evolution of theories, which afford no immediate or adequate return for the labour which is necessarily involved, is a matter upon which the aeronautical industry as a whole has reason to congratulate itself.

Not infrequently, the essentially practical man is apt to regard the theorist as one who should be kept at arm's length—who, because he does not understand the practical difficulties which are encountered, cannot make effective use of his knowledge. On the other hand, the theorist is sometimes disposed to view the constructional side as a thing apart, between which and himself there can be no direct connection. The opinions thus entertained may be based on actual experience—the practical man seldom approaches the theorist until he is driven into a corner—and estrangement often results because of the inability of the constructor to formulate the exact conditions governing the problem, which he wishes to have solved, in a sufficiently precise manner to enable the theorist to set to work; and the latter cannot appreciate the relative value of the facts as they arise, and is often led away on an investigation into matters of secondary importance, leaving the main problem untouched. In actual fact, theory and practice are mutually dependent upon one another, and, as we have repeatedly advocated in these columns, for their common advancement, should be developed together.

No doubt many of our readers are familiar with the vortex theory of sustentation as presented in Lanchester's "Aerial Flight"—a work that has, since its publication, become a standard text book on the science of Aeronautics. This theory is carried a stage further in the paper to which we have already referred, and numerical examples are given in support of the soundness of the ideas upon which it is based.

Briefly expressed, the Lanchester theory of sustentation is this—the sustentation of an aeroplane is derived from the reaction due to the production of two equal and opposite vortices in the wake of the aerofoil. The existence of this vortex pair cannot be denied, as optical demonstration, and our knowledge of the character of the air flow over the surfaces of an aerofoil, support the contention that such a motion of the air does take place; opinions differ, however, as to the extent to which the deductions made therefrom are valid, and how far the

results based upon these assumptions can be immediately applied in practice.

Be that as it may, few of those who have a nodding acquaintance with the subject under discussion, and who were present at the reading of the paper, which is admittedly extremely abstruse, could fail to realise that, whatever may be its limitations at the moment, the theory may be of tremendous advantage in the future in determining appropriate wing sections for aeroplanes, thus saving an immense amount of labour in wind tunnel experiments; and this belief was strengthened by the remarks passed by Mr. Lanchester in the course of his reply to the discussion. In saying this, we are mindful of the fact that wing efficiency is not the sole criterion or desirable feature in a wing—that the maintenance of the lift curve with increasing angle of attack over a wider range than at present, that the centre of pressure should move forward with increasing angle of attack are also important, and that certain wing forms have particular constructional advantages attaching to them—and that the mathematical treatment is very far from complete; but it must be remembered that Mr. Lanchester claims to have designed an aerofoil as far back as 1894, on the basis of the earlier investigation, which had a lift/drag ratio of 17 to 1, and he would be a bold man indeed who would deny the possibility of any utility in a theory evolved by a man of the standing of Mr. Lanchester, especially at the present stage of our knowledge of aeronautical theory.

At the present time, experimental investigation moves extremely slowly. The essential idea underlying all research is that one factor only in the experiment shall

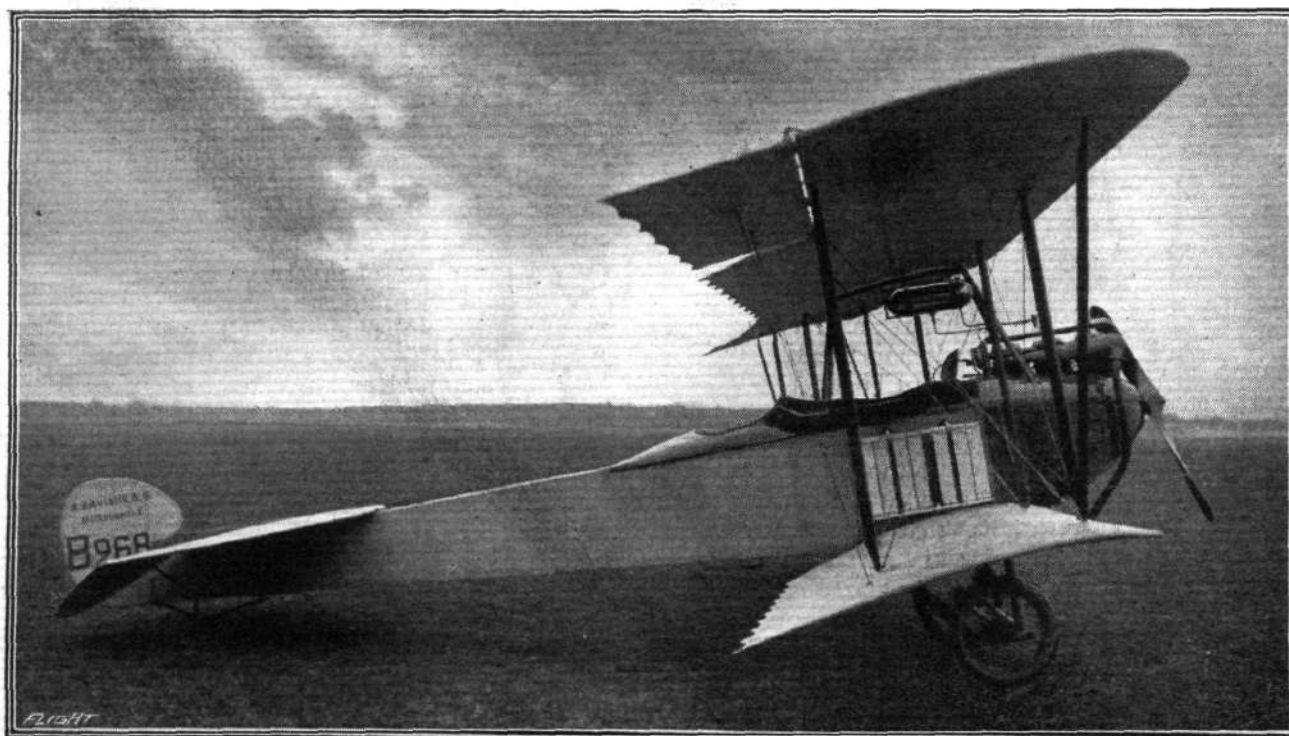
be changed in making a new set of observations in order that the deductions which can be made from the results obtained may not be obscured by conflicting possibilities; and, in consequence, an attempt is made to achieve this object by varying the amount of camber at a particular part of a wing section, or the position of maximum camber, or the aspect ratio, &c., experiment succeeding experiment on these lines. This is the practice followed at the National Physical Laboratory, and, in the light of our present knowledge, is the best that can be devised. Mr. Lanchester admits that the vortex theory as presented in the paper is incomplete, that further mathematical investigation, or, failing this, a graphical analysis to take account of the many varying factors which enter into the question under discussion, will be necessary; but this detracts in no way from the value of the paper. Between the evolution of a theory and its establishment upon sound lines, much elaborate investigation and analysis are always required, and it is upon this that Mr. Lanchester is concentrating his attention. In this work, which is of an advanced mathematical character, he desires and deserves the assistance of the best mathematical brains that this country can produce, and it is regrettable that our mathematicians should exhibit such apathy towards work of this kind.

The results achieved may be qualitative only, and not quantitative; but if they are able to eliminate a number of the extensive and protracted wind tunnel experiments which it is now necessary to undertake, such labour will not be in vain, and it is in this light that we welcome the immediate extension of the vortex theory of sustentation.

Air Attack on a Steamer.

On arrival at South Shields on Wednesday from the Isle of Wight, the officers of the s.s. "Blonde" reported that when off the North Foreland on Monday morning a German aeroplane circled over the ship and dropped five bombs. As soon as the cross beneath the planes was noticed, it was recognised that the machine was a

German one, and the captain therefore put on full speed and steered the ship on a circular course. Two bombs fell about 20 feet from the stern of the vessel, and two a similar distance from the bows. Before discharging the last one, the Germans came down to about 300 feet above the vessel, but their efforts were no more successful, and the aeroplane went off southwards.



One of the latest Aviatik biplanes, of which a considerable number are in use in the present war.

A TWO-SEATER NIEUPORT BIPLANE.

IN the accompanying photographs is seen a biplane which has been recently issued from the Nieuport works. Hitherto the Nieuport firm have chiefly concentrated

object of improving the views from both pilot's and passenger's seats and to give a gunner as far as possible a free range of firing in any direction.

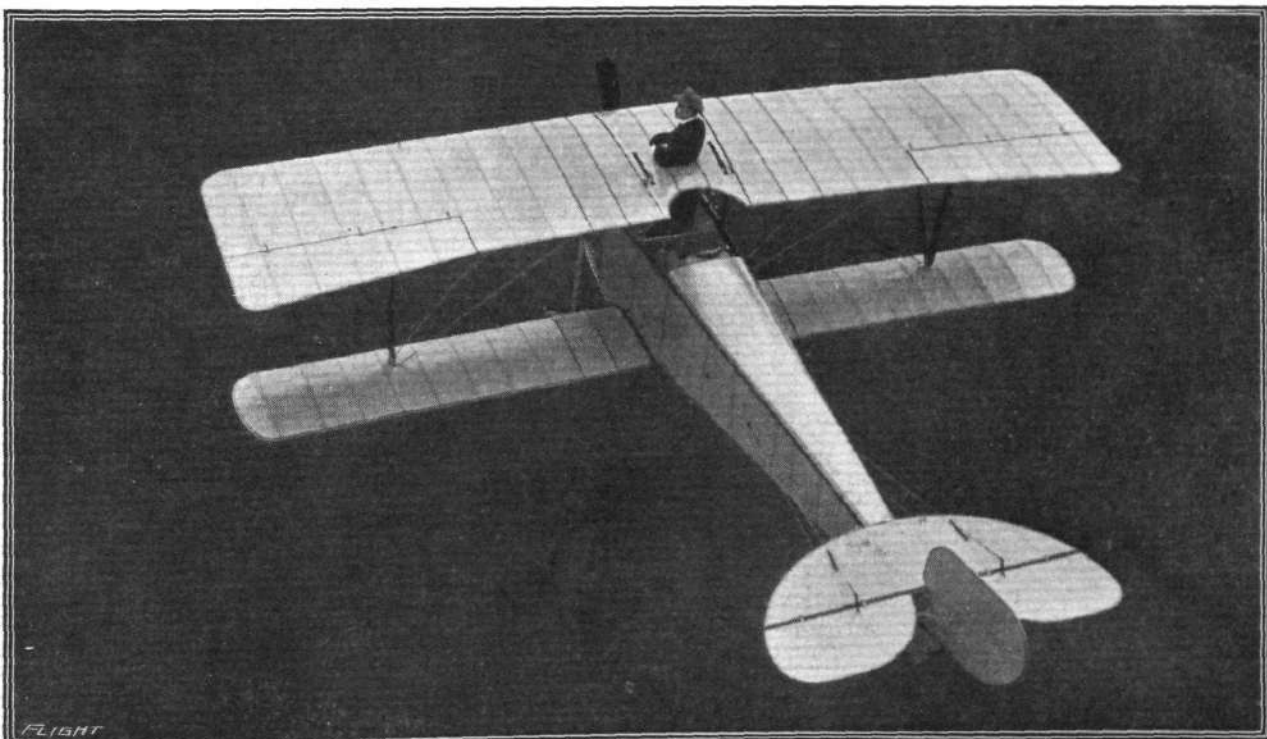


Three-quarter front view of the two-seater Nieuport biplane. The view from the pilot's seat is excellent in every direction owing to the small chord of the lower plane, whilst that of the gunner is equally good, he being able to look over the lower plane for a forward and downward view. By standing up in his seat, with his body projecting through the opening in the top plane, he is free to fire his rifle in any direction except straight downwards.

their energies on machines of the monoplane type, and with the exception of the extra pair of wings their new machine follows very closely on the lines of the monoplanes that made the late Nieuport brothers famous, and it will be noted that everything has been done with the

Generally speaking, this Nieuport military tractor biplane follows standard practice as regards the general arrangement, but upon closer examination several original ideas are noticed.

From the photographs it will be seen that only one

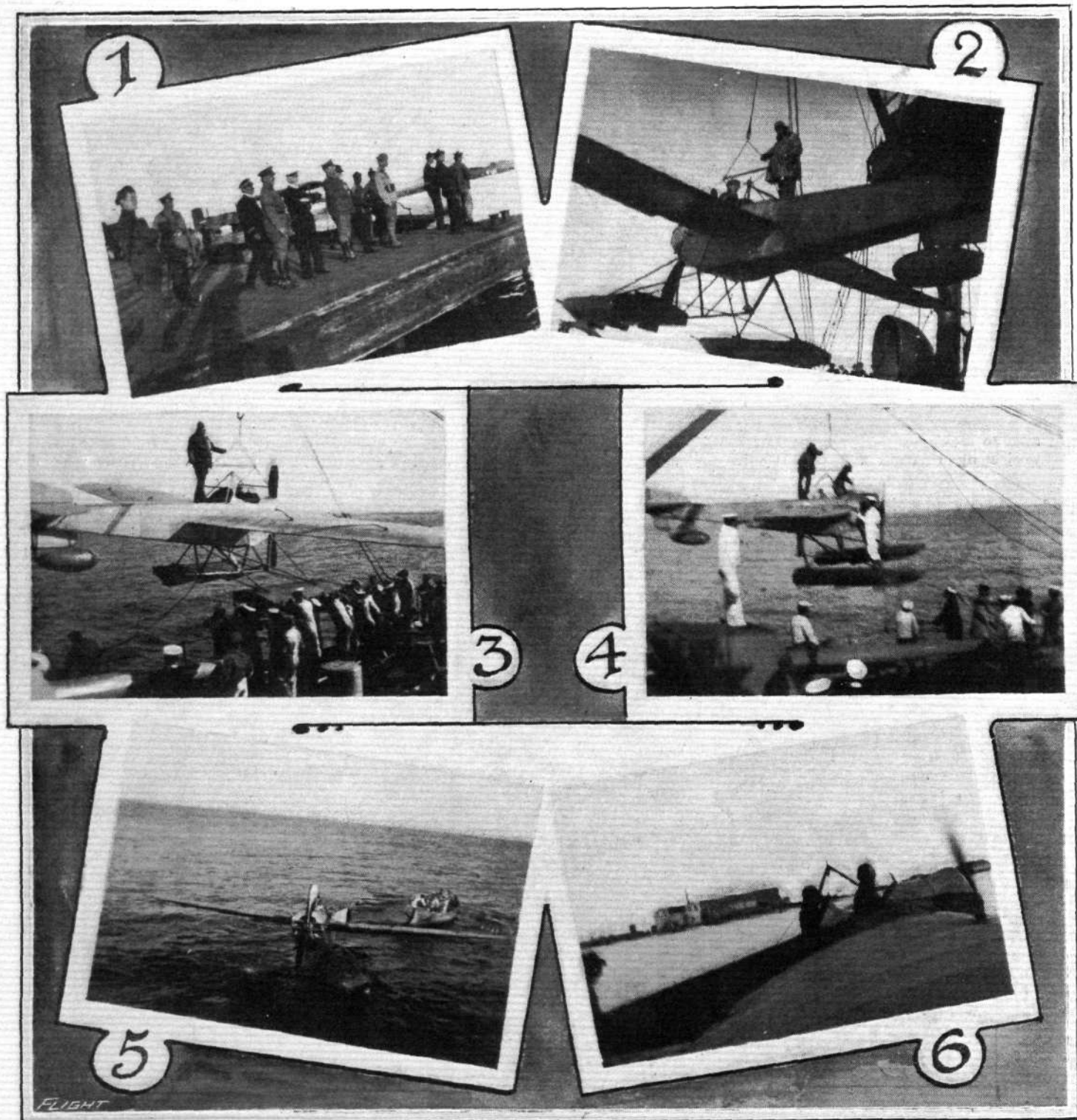


View from above of the Nieuport two-seater biplane, showing the hole in the top plane for the gunner when he wishes to fire in an upward or forward direction.

pair of struts on each side of the *fuselage* separates the two planes, and these struts, instead of being parallel to one another, as is usually the case, run to a point on the bottom plane. The reason for this is that the lower plane has only a single spar, which takes the form of a steel tube round which the wing pivots. The upper plane is fitted with two spars in the usual manner, to the rear one of which are hinged the two *ailerons*. For lateral control a hand lever in front of the pilot operates simultaneously the *ailerons* on the upper planes, whilst

warping, or, more correctly speaking, pivoting, the corresponding half of the lower plane. This system undoubtedly provides ample lateral control. In fact we should imagine that the *ailerons* on the top plane would alone be sufficient for the maintenance of lateral stability, and the chief advantage in having such a small chord to the lower plane would lie in the fact that it only obscures the downward view to a very slight extent.

As for the arrangement of the gunner's quarters, his seat is placed in the usual manner in front of that of the



UNSHIPPING AN 80 H.P. NIEUPORT SEAPLANE AT PORT SAID.—1. General Maxwell and Admiral Peise watching the operations from ashore. 2, 3 and 4. In process of swinging the Nieuport from the cruiser "Doris." 5. At rest on the sea. 6. Getting away.

pilot, and when sitting down inside his cockpit a very wide range of vision is obtained in a downward and forward direction.

In order that the propeller may be avoided when firing forward, there is a circular opening in the top plane through which the gunner can pass the upper portion of

his body when standing in his seat. In this position, the muzzle of the gun or rifle is above the circumference described by the tip of the propeller, so that the gun can be fired straight forward, or in an upward direction. Altogether the Nieuport firm is to be congratulated on the machine.

THE AEROPLANE IN WAR— PAST, PRESENT, AND FUTURE.

IN a strikingly able article from a special correspondent of the *Morning Post*, present with the British General Headquarters, on new views in war and the aeroplane's mission, the many revolutionary lessons learned up to date through the present war are concisely summarised and some home impressions corrected. The correspondent continues:—

"Would it be wonderful then if the man had not yet arrived who could be master of to-day's conditions, since the new weapons in use are not one, but, many, and the army itself, compared with armies of the past, is indeed a new weapon, the most tremendous and exacting ever placed in a commander's hand?"

"We may, therefore, put on record the Army's conviction that the trench is not going to dominate the warfare of the future to the extent, at any rate, that it has done during the past winter, and that the old strategical problems, based on the obtaining of superiority at decisive points, by the old methods of concentration and concealment will reappear for solution. When to that one objected that, thanks to the air service, concealment could no longer be achieved, one was met with the chief of one's surprises. While in England we have been regarding the aeroplane as growing more and more mistress of the situation at the front, speculation has rather concerned itself with the means of outwitting her inquisitive attentions. Far from the aeroplane dominating more and more the enemy's movement, one was assured that with every week it finds such domination more difficult; that faced by the peril of detection, the cunning on both sides has reached such a pitch that the discovery of the positions of great guns in action has become largely a matter of luck, owing to the subtlety with which even their flashes are screened from observation, the cleverness of the German gunners being no whit behind our own.

"It was pointed out, moreover, that despite the ceaseless vigilance and the incontestable competence of our own airmen, the enemy, notably at Ypres, has been able to assemble a force in close proximity to our lines which greatly exceeded our estimate, and to effect what might not unfairly be called a surprise. It was further urged that if such a concentration could be accomplished under our very eyes, strategical surprises will still be possible, provided that all movement takes place at night, that all means of hiding troops are utilised, and that methods of concealment at present in embryo should be duly developed.

"Backed by experience and so much sound opinion, such a view must have great weight, yet it may not be presumptuous to point out some objections. In the first place, such concentrations as took place at Ypres, Soissons, and elsewhere were rather of a tactical than of a strategical character, the movement of troops by rail without even, it may be, their first line transport, and behind the shelter of trenches affording a condition of unnatural security. The real strategical objective must place reliance on vast parks of stores and heavy lines of transport which must always be on the road and are extremely difficult of concealment, and the very noise of their movement would give away their strength to a trained observer able to get, as he infallibly could, within hearing of it.

"In the second place, though cunning in concealment may increase the airman's difficulties, it seems to be forgotten that the airman at present is in offence little more than an expensive luxury, little more, indeed, than was artillery in Flanders in Tartaglia's day. He has done magnificently, more than was dreamed; but what he has done is but a trifle compared with what lies before him. He is numbered now by his tens. What will happen when he is numbered by his thousands? Is that an extravagant assumption?"

Curtiss Factory in Canada.

ACCORDING to advices from New York, a new company, the Curtiss Aeroplanes and Motors Co., Ltd., has been registered, with a capital of \$50,000, for the purpose of starting a branch aeroplane factory and school of the Curtiss Co. in Canada. The head office is at Toronto.

tion? Surely not. The modern provision of artillery would have seemed inconceivable in the early days of the gun, and the aeroplane is of the two by far the more wonderful and by no whit the more difficult weapon. To-day the airman is only tentatively something more than a scout, dropping an occasional bomb to distract the enemy. What will happen when his scouting has ceased to count in comparison with his destructive violence; when he can be flung out over the foe in a cloud to rain fire out of heaven? Ought we not, in looking ahead, to look ahead most of all at him? While battles are fought on the earth for inches, in the air the radius lengthens by hundreds of miles. Is not that a significance? Never before could an army strike save within a short distance of its front, but now it can throw its missiles from one capital to another.

"War is just war still," said one of our ablest generals; 'you won't find it changed. The armoured car? Yes, useful, no doubt, where you can use it. Not everywhere. Very effective here and there. Worth having. But only a few. The heavy howitzer? Yes, terrifying, till you get used to it, and doing extraordinary things. Shell goes into a house, and the whole house goes up. A little red dust, that's all that's left of it. Yes, it's very terrifying. One has to have them. And the aeroplane? Well, the aeroplane has done a lot for us, but we are going to outlive it. The aeroplane finds its business harder every day.'

"We were taken up almost on our arrival to the headquarters of the air fleet. A most charming situation, with as fine a turf for landing as has the Plain itself. Airmen can almost always count on salubrious quarters, and their work makes them indifferent to an excess of air. The air was shrewd and stiff that day, and one can remember how, not so long ago, not a wing would have been spread to it. Now all the heed the airmen paid was to put their nose into it as they alighted. Like thistledown they were blown off the earth into the blue air, soon to be lost to vision in the purple haze of the plain, and like thistledown others dropped out of the blue air. Anything less like war could not possibly be imagined, yet each carried deadly weapons at his disposal, each might bring news that would win a victory. How different from the scout of old days, dropping road-stained and exhausted from his trembling horse! The contrast indeed was greater, for the scout had really brought only himself home; his news he had thrown out into the air from the front, thirty miles away; it had been caught by the maze of delicate wires, and, long before the scout himself arrived, its purport had been discussed at headquarters, and an order had perhaps already been issued on the strength of it, setting troops in motion. Marvellous; but the romance of the thing was richer for that dripping horseman who had thrown soul and body into the scale against fate. The airman needs as high a courage and capacities more highly trained, but the exquisite mechanism he controls has come between him and the simpler forces, that naked touch of nature which of itself is a reward.

"On the ground there was little of novelty. Experience had confirmed the theories and the practice of Farnborough and Netheravon. The only drawback to some of our machines, we were told, was that as the machine practically flies itself there is a danger of the operator going to sleep. The operators who alighted while we were there showed at any rate no sign of sleepiness. One of them, single-handed, not so long before, had engaged two of the enemy's Taubes, each carrying an observer, and succeeded, though he had but one pair of hands for control and to fire the rifle, in driving off one of the planes and bringing down the other.

"Here were the church bells calling from the vale to prayer, and these great white-winged creatures coming noiselessly out of the air; a man might be pardoned for mis-ing the implications of this new mode of warfare. Yet one clings none the less to a convinced belief in the revolution it is to accomplish."

Lincoln Beachy Killed.

CABLE messages from San Francisco state that on Sunday afternoon Lincoln Beachy met his death while making a flight from the Panama-Pacific Exposition grounds. It appears that while looping over the bay the machine fell from a height of 2,000 feet. The pilot's body was recovered later.

AIRCRAFT WORK AT THE FRONT.

OFFICIAL INFORMATION.

IN the statement issued by the War Office on the 11th inst. there was the following :—

"The British aircraft were active and succeeded in destroying the railway junctions at Courtrai and Menin."

In the statement issued on the 13th inst. there was the following :—

"Our aircraft have been very active, and the junctions at Don and Douai were destroyed."

A despatch from Sir John French on the 14th inst. stated :—

"A train at Don station was blown up by our aircraft this morning."

The bi-weekly despatch from Sir John French issued on Tuesday night included the following item :—

"The Royal Flying Corps have secured further successes during the last few days, although fog has interfered materially at times. On the 12th the railway junctions at Don and Douai were bombed and damaged, and on the 13th a train in Don station was blown up."

In the despatch from "Eyewitness," dated March 12th, and dealing with the operations round Neuve Chapelle, there was the following :—

"During the day two remarkable feats were performed by our airmen. One flying at a height of only 150 ft., in order to make sure of his mark, dropped a bomb on the important railway bridge at Menin, destroying one of the piers. Another, flying over Courtrai Railway Junction, dropped a bomb on the station, and completely wrecked it. These are both points of vital importance on the German communications."

In the official *communiqué* issued in Paris on the 11th inst. it was stated :—

"In Belgium a British air-squadron successfully bombarded Westende."

In the *communiqué* issued in Paris at midnight on the 14th inst. there was the following :—

"A British air-squadron effectively bombarded Westende."

In a semi-official statement issued in Petrograd on the 12th inst. there was the following :—

"The comparatively calm and clear weather of the last few days has been made use of by us, and by the enemy, for aerial reconnaissances. Many aeroplanes and dirigibles have flown over various positions."

"Our large dirigible, 'Ilia Mourmetz,' took part. The enemy's aviators threw some twenty small bombs on Ossowitz, but did no damage to the fortifications, which have to support thousands of heavy bombs from howitzers."

"On the right bank of the Vistula, near the village of Verzbovo, we captured a brand new German aeroplane, in first-class condition, with two aviators. In the Pilitza region, Captain Kravtsevitch attacked and put to flight a German aeroplane, which, however, succeeded in coming down in its own lines."

"At certain places the enemy dropped incendiary bombs from its aeroplanes, but was unable to set fire to anything. Both our heavy artillery and that of the enemy have shown a very great activity."

THE BRITISH AIR SERVICES.

UNDER this heading are published each week the official announcements of appointments and promotions affecting the Royal Naval Air Service and the Royal Flying Corps (Military Wing) and Central Flying School. These notices are not duplicated. By way of instance, when an appointment to the Royal Naval Air Service is announced by the Admiralty it is published forthwith, but subsequently, when it appears in the LONDON GAZETTE, it is not repeated in this column.

Royal Naval Air Service.

THE following was announced by the Admiralty on the 12th inst. :—

Temporary Surgeon F. L. Duckworth to the "President," additional, for Kingsnorth Air Station. To date March 31st.

The following appeared in the *London Gazette* of the 12th inst. :—
W. A. Burns to be Flight Lieutenant. Dated Feb. 27th, 1915.

The following was announced by the Admiralty on the 13th inst. :—
Temporary Surgeon K. Wolferstan to the "President," additional, for Eastchurch Air Station. To date March 12th.

Flight Sub-Lieuts. F. W. Strong, R. M. Field, A. Q. Cooper, F. J. Rutland, G. H. Scott, and J. C. P. Wood to the "President," for R.N.A.S. To date March 12th.

The following was announced by the Admiralty on the 15th inst. :—
Probationary Flight Sub-Lieut. T. C. Vernon to the "President," for Central Flying School. To date March 10th.

A. E. Hunn, entered as Warrant Officer (Second Grade), with seniority of March 13th, and appointed to "President," additional, for R.N.A.S.

The following appeared in the *London Gazette* of the 16th inst. :—

The undermentioned gentleman has been granted a temporary commission as Flight Lieutenant: B. Binyon. Dated March 12th, 1915.

The undermentioned Probationary Flight Sub-Lieutenants have been confirmed in the rank of Flight Sub-Lieutenant: F. W. Strong; dated Aug. 18th, 1914. G. H. Scott; dated Oct. 24th, 1914. R. M. Field; dated Oct. 28th, 1914. J. C. P. Wood; dated Nov. 10th, 1914.

The undermentioned acting Flight Sub-Lieutenant has been confirmed in the rank of Flight Sub-Lieutenant: F. J. Rutland. Dated Dec. 15th, 1914.

The undermentioned Probationary Flight Sub-Lieutenant for temporary service has been confirmed in the rank of Flight Sub-Lieut. for temporary service: A. Q. Cooper. Dated Nov. 14th, 1914.

THE following was announced by the Admiralty on the 16th inst. :—

Acting Lieut. H. F. Towler, R.N.R., transferred to Royal Naval Air Service as Probationary Flight Sub-Lieutenant, and appointed to the "President," additional, for R.N.A.S. To date March 14th.

Temporary Sub-Lieut. R. T. Hilliard Duff, R.N.V.R., transferred to the Royal Naval Air Service as Probationary Flight Sub-Lieutenant, and appointed to the "President," additional, for R.N.A.S. To date March 15th.

Royal Flying Corps (Military Wing).

THE following appeared in a supplement to the *London Gazette* issued on the 11th inst. :—

The undermentioned appointments are made:

Flying Officers; dated Feb. 19th, 1915: Lieut. J. E. A. Baldwin, 8th (King's Royal Irish) Hussars, and to be seconded; Second Lieut. E. D. Horsfall, 9th (Service) Battalion Rifle Brigade (Prince Consort's Own), and to be transferred to the General List, New Armies; and Second Lieut. C. C. Wigram, Special Reserve.

Special Reserve. Supplementary to Regular Corps.—The undermentioned to be Second Lieutenants (on probation): H. V. Champion de Crespigny, dated Feb. 26th, 1915, and R. H. S. Mealing, dated Feb. 27th, 1915.

The following appeared in the *London Gazette* of the 12th inst. :—

The undermentioned Flight-Commanders are graded as Squadron-Commanders whilst holding appointments as Instructors at the Central Flying School: Capt. F. F. Waldron, 19th (Queen Alexandra's Own Royal) Hussars; dated Oct. 17th, 1914. Lieut. (temporary Capt.) A. H. L. Soames, 3rd (King's Own) Hussars; dated Feb. 9th, 1915.

The undermentioned appointments are made:

Flying Officers: Second Lieut. J. J. Hammond, Special Reserve; dated Jan. 29th, 1915. Second Lieut. F. W. Goodden, Special Reserve; dated Feb. 23rd, 1915.

Special Reserve. Supplementary to Regular Corps.—Temporary Second Lieut. R. B. Bourdillon to be Second Lieutenant (on probation). Dated Feb. 12th, 1915.

The following appeared in a supplement to the *London Gazette* issued on the 15th inst. :—

Special Reserve. Supplementary to Regular Corps.—The undermentioned to be Second Lieutenants (on probation): W. E. Collison; dated Feb. 22nd, 1915. F. L. Scholte; dated March 8th, 1915.

The Royal Aero Club of the United Kingdom

COMMITTEE ELECTION.

THE following Members have been nominated:—

Griffith Brewer.	Flight Commander F. K.
Ernest C. Bucknall.	McClean, R.N.A.S.
John D. Dunville.	Squadron Commander Alec
Col. H. C. L. Holden, C.B.,	Ogilvie, R.N.A.S.
F.R.S.	Mervyn O'Gorman, C.B.
Prof. A. K. Huntington.	C. F. Pollock.

The number of candidates not exceeding the number of vacancies, no ballot paper has been sent to the members.

ANNUAL GENERAL MEETING.

The Annual General Meeting of the Members of the Royal Aero Club of the United Kingdom will be held on Tuesday, March 23rd, 1915, at 5 o'clock, at 166, Piccadilly, London, W.

AGENDA.

1. To elect Vice-President and Council for the ensuing year.
2. To confirm the following alteration in the Club Rules:—
"7. Ballot Papers.—Not less than 7 days before the Annual General Meeting a ballot paper shall be posted to every Member. The ballot paper shall contain the names of candidates nominated for the Committee in the form of an alphabetical list. The same type is to be used throughout. *In the event of the number of candidates nominated for election to the Committee not exceeding the number of vacancies, no ballot paper shall be sent, the candidates so nominated being ipso facto elected.*"

NOTE.—The alteration, which is indicated in italics, was passed by the Committee at its Meeting on March 9th, 1915.

3. To announce Committee election.
4. Notices of Motion.

The following Notices of Motion have been received:—

- (1) The Committee shall have power during the continuance of the War to appoint one or more additional Vice-Chairmen to hold office until the next Annual General Meeting.
- (2) The Committee shall have power to co-opt Temporary Members to the Committee during the continuance of the War, to hold office until the next Annual General Meeting.

Aviators' Certificates.

The following Aviators' Certificates have been granted:—

- 1103 Flight Sub-Lieut. Redford Henry Mulock, R.N.A.S. (Short Biplane, Royal Naval Flying School, Eastchurch). March 9th, 1915.
- 1104 2nd Lieut. Alan Mushet Morison, R.F.C. (Maurice Farman Biplane, Military School, Brooklands). March 11th, 1915.
- 1105 Flight Sub-Lieut. Laurence Henry Forster Irving, R.N.A.S. (Grahame-White Biplane, Grahame-White School, Hendon). March 11th, 1915.
- 1106 Flight Sub-Lieut. Wilfred Henry Dunn, R.N.A.S. (Grahame-White Biplane, Grahame-White School, Hendon). March 11th, 1915.
- 1107 Norman Hatfield Read (Maurice Farman Biplane, Military School, Brooklands). March 11th, 1915.
- 1108 Flight Sub-Lieut. John Stanton Fleming Morrison, R.N.A.S. (Grahame-White Biplane, Grahame-White School, Hendon). March 11th, 1915.
- 1109 Algernon John Insall (Maurice Farman Biplane, Military School, Brooklands). March 12th, 1915.
- 1110 Gilbert Stuart Martin Insall (Maurice Farman Biplane, Military School, Brooklands). March 14th, 1915.

- 1111 Flight Sub-Lieut. James Brian Patrick Ferrand, R.N.A.S. (Grahame-White Biplane, Grahame-White School, Hendon). March 15th, 1915.
- 1112 Howard Lister Cooper (Maurice Farman Biplane, Military School, Brooklands). March 15th, 1915.
- 1113 Flight Sub-Lieut. George Hancock Reid, R.N.A.S. (Grahame-White Biplane, Grahame-White School, Hendon). March 15th, 1915.

THE FLYING SERVICES FUND.

Administered by The Royal Aero Club.

THE Lords Commissioners of the Admiralty and the Army Council having signified their approval, the Royal Aero Club has instituted and will administer a fund originated by M. André Michelin for the benefit of officers and men of the Royal Naval Air Service and the Royal Flying Corps who are incapacitated on active service, and for the widows and dependents of those who are killed.

The fund is intended for the benefit of all ranks, but especially for petty officers, non-commissioned officers and men.

In view of the great utility of the work of the Flying Services, evidence of which has been repeatedly given in the official despatches of the Commander-in-Chief, the skilful and daring flights into enemy country, and the protection afforded by the continuous patrolling of our coast by aircraft, it is confidently expected that the British public will welcome this opportunity of showing their appreciation by subscribing promptly and liberally to the fund.

The Right Hon. Lord Kinnaid has kindly consented to act as Honorary Treasurer to the Fund.

Subscriptions should be forwarded to The Flying Services Fund, The Royal Aero Club, 166, Piccadilly, London, W., or to Barclay and Co., Ltd., 1, Pall Mall East, London, S.W. Cheques should be crossed "Barclay and Co., Ltd."

TULLIBARDINE, Brig.-General,
Chairman of the Royal Aero Club.

	£	s.	d.		£	s.	d.
Total subscriptions received to March 10th, 1815...	7,376	3	5	The Lang Propeller Co. John I. Thornycroft and Co. ...	5	0	0
Marriott Parkinson ...	10	0	0	Martin Dale ...	25	0	0
George Spencer, Moulton & Co., Ltd.	10	10	0	E. W. Janson ...	10	0	0
The Vacuum Oil Co., Ltd. ...	10	0	0	Mather & Platt, Ltd.	5	0	0
Hewlett and Blondeau and Employes ...	20	10	0	The Canteen of the Royal Naval Flying School, Eastchurch	20	0	0
James Gaunt...	5	0	0				
H. M. Heal ...	0	10	0	Total, March 17th, 1915 ...	£7,507	13	5
166, Piccadilly, W.				B. STEVENSON, Assistant Secretary.			

The Roll of Honour.

THE lists of casualties in the Expeditionary Force, reported from General Headquarters, contained the following:—

Under date of March 10th:

Accidentally Killed.

Second Lieut. A. G. Irving, R.E. and R.F.C.
Lieut. A. E. Morgan, R. Fus. and R.F.C.

Air Mechanics, &c., Wanted for R.N.A.S.

THE recruiting officer of the Naval Air Service Depôt at Hendon states that 400 air mechanics are required immediately at the depôt. Pay is from 2s. to 4s. per day, with all found. There are also vacancies for good boat builders for the duration of the war; pay 7s. a day, with all found.

Applications should be made to the recruiting officer, London Aerodrome, Hendon.

FROM THE BRITISH FLYING GROUNDS.

London Aerodrome, Collindale Avenue, Hendon.

Grahame - White School.—Wednesday, last week, Probationary Flight Sub-Lieuts. Dunn, Ferrand, Irving, Morrison and Reid, solo circuits, eights, &c. Mack (new pupil) rolling and straights with Instructor Winter. Probationary Flight Sub-Lieuts. Feeney, Hards, Hood, Jackson, Vernon and Greer, straights with Instructors Manton, Winter and Russell.

Thursday, Probationary Flight Sub-Lieuts. Ferrand, Irving, Dunn, Morrison and Reid, circuits, eights, &c. Feeney, Greer, Hards, Hood and Mack, straights with Instructors Manton, Winter and Russell, afterwards Probationary Flight Sub-Lieuts. Dunn, Irving and Morrison going in for *brevet* tests and gaining certificate.

Friday, Probationary Flight Sub-Lieuts. Ferrand, circuits, eights, landing practice, &c.; Hards and Hood, solo straights; Feeney, Jackson and Mack, straights with Instructors Manton, Russell and Winter.

Saturday, too windy for pupils.

Sunday, Probationary Flight Sub-Lieuts. Ferrand and Reid, solo circuits, eights, landing practice, &c.; Hood, solo straights. Feeney, Hards, Jackson and Mack, straights with Instructors Manton, Winter and Russell.

Beatty School.—During last week the following pupils were out, accompanied by the instructor:—Messrs. Bond (39 mins.), Cornish (42), Roche (25), De Meza (12), Ormsby (35), Hayward (20), Fanning (8), Forbes (57), Bright (29), Laver (62), Vickers (5), Cooper (15), Leong (39), Allcock (25), Chapelle (30), Fraser (30), Whincup (15), and Bransby Williams (45). The instructors were Messrs. G. W. Beatty, J. Roche-Kelly, and C. B. Prodder, the machines in use being Beatty-Wright two-seater machines with dual control.

Messrs. Perrot, Roche, Forbes, Bright, Lever, and Leong are now ready for their certificates; while Mr.

Bransby Williams is taking extra practice previous to taking up his duties as instructor at the school.

Hall School.—Monday, last week, pupils having instruction alone with full control: Messrs. Waterson (10 mins.) and J. Furlong (26).

Wednesday, pupils having practice alone with full control: A. Davy (17 mins.), Mitchell (17½), and Cini (17), on tractor.

Thursday, A. Davy (22 mins.); McConnochie three good circuits and seven figures of eight, afterwards taking first part of Royal Aero Club certificate in fine style.

Friday, McConnochie secured second part of R.A.C. certificate in excellent style with heavily-banked right and left-hand turns.

Saturday, Lieut. Raymond Barker (15 mins.), Furlong (12), and Mitchell (5).

Sunday, Lieut. Raymond Barker (25 mins.), Cini (20), and Mitchell (22).

Instructor for the week, J. L. Hall.

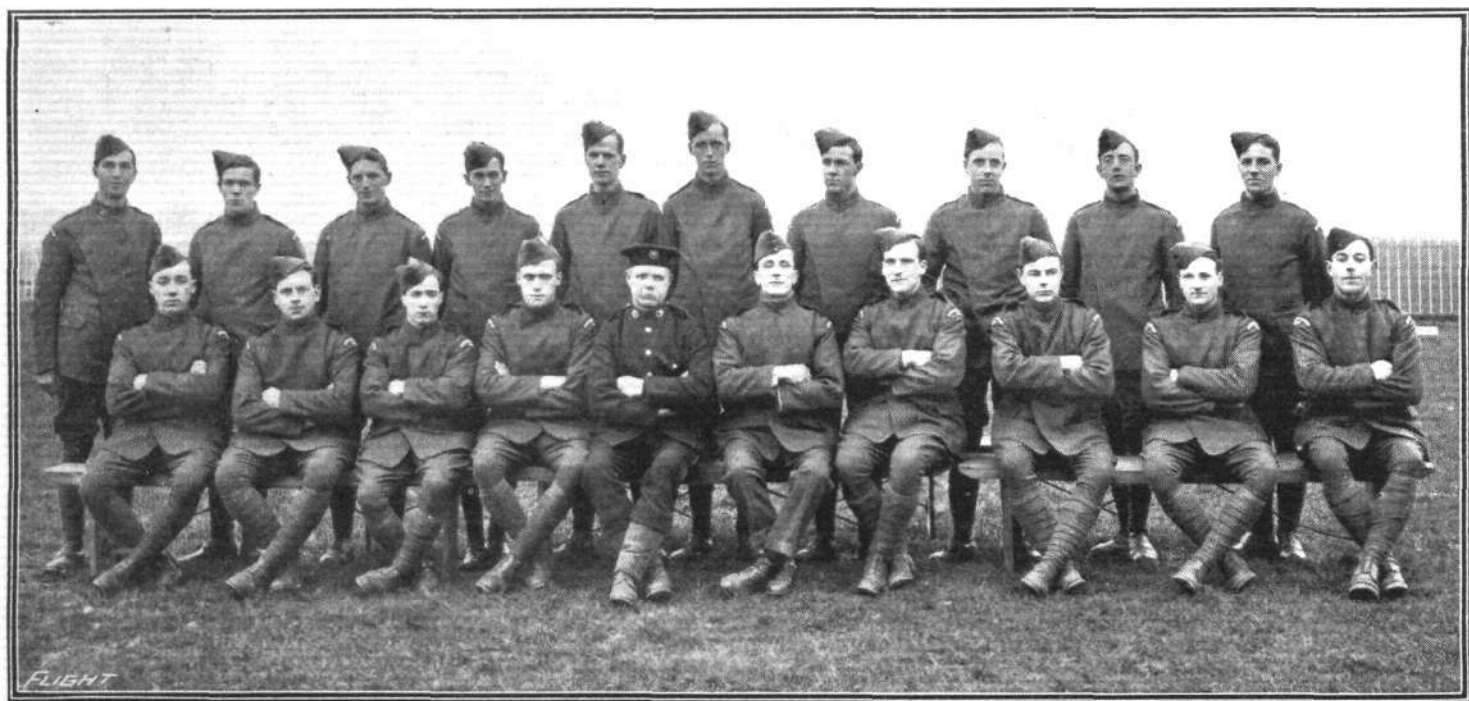
London and Provincial Aviation Co.—Monday and Tuesday, last week, too windy for practice.

Wednesday, M. G. Smiles, test flight; Messrs. Henderson, Abbott, Watson and England Derwin, straights; Messrs. Noakes and Bransby Williams, circuits and eights (extra practice); Messrs. Goodwin, Deschamps and Fanning, rolling.

Thursday, test flight, M. G. Smiles, 10 mins.; Messrs. Abbott and England Derwin, straights; Mr. Watson, half circuits; Mr. Goodwin, rolling; Mr. Noakes, circuits and eights (extra practice).

Friday, test flights, Messrs. Warren and Smiles; Messrs. Deschamps, England Derwin and Henderson, straights; Mr. Watson, circuits, improving rapidly; Mr. Noakes, circuits.

Saturday, too windy for practice.



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THE SOUTH AFRICAN AVIATION CORPS.—A group of air mechanics. From left to right: (Back row) A. J. Adams, W. F. Jamieson, C. B. Bratley, E. E. Gardier, A. S. Readpath, E. F. W. Webber, H. Smith, R. Walley, W. F. Turner. (Front row) C. G. Able, E. Hutchings, A. A. Hamblin, W. H. Barnett, C. T. Healey, T. S. Jobling, A. Behm, J. A. Lambert, F. E. Phillips, E. G. Eyles.

Sunday, test flight; M. G. Smiles, 10 mins.; Mr. Goodwin, rolling; Mr. Henderson, straights.

Ruffy-Baumann School.—Wednesday, last week, on 60 Caudron with E. Baumann: Mr. Jackson (10 mins.), Kenworthy (10), Mr. Cole (5), Bell (10), and Roobaert (10). On 45 Caudron: Mr. Blandy 15 mins. (rolling).

Thursday, on 60 Caudron: Blandy (8 mins.), Hydon (15), Jackson (10), King (10), Roobaert (14), and Bell (14). H. James out on 45.

Friday, with H. James on 45: Bell (12 mins.), Roobaert (12), and Hydon (12). On 69 Caudron with E. Baumann: King (10 mins.), and Pierrot (10), extra practice.

Saturday, on 45, with H. James: King (12 mins.), Hydon (8), and Roobaert (4). E. Baumann out on 60 with Mr. Ruffy.

Sunday, E. Baumann out on 60. With H. James on 45: Kenworthy (8 mins.), Hydon (8), Cole (8), King (8), and Jackson (8). E. Baumann out on 60 with passengers.

Monday, with E. Baumann on 60 Caudron: Mr.

Kenworthy (14 mins.), Blandy (10), Jackson (12), King (15), Bell (12), and Roobaert (12).

On 45 with H. James: King (8 mins.), Bell (8), Hydon (8), Blandy (8), Kenworthy (8), Roobaert (8), Cole (8), and Jackson (8).

Northern Aircraft Co., Ltd.

The Seaplane School, Windermere.—Flying was possible every day during last week, and continued nearly incessantly from daylight to dark. An immense amount of work has been got through. The following have received instruction on either the dual-control Avro or N.A.C. propeller biplanes:—Flight Lieut. L. L. Atherton, Lieut. T. Lindsay Bainbridge, Messrs. R. Buck, C. A. Barber, A. Johnson, F. A. M. Macintyre, J. L. Parker, G. L. Railton, J. F. Ridgeway, P. O. Robinson, S. J. Sibley and H. Slingsby, R. O. Lashmar, P. O. Robinson and J. L. Parker taking extra practice. Mr. W. Rowland Ding in addition was up with Lieut. Steele, R.N.F. and a Naval lieutenant. Steps have been taken to increase the instruction staff to four and secure further machines owing to the rapid growth of the school.

✕ ✕ ✕ ✕

Fatal Accident at Eastbourne.

It is with the greatest regret that we have to record the death of Flight Sub-Lieut. A. G. Shepherd as the result of an accident at Eastbourne on the 11th inst. At the inquest on the following day it was stated that Sub-Lieut. Shepherd started on a biplane from the seaplane sheds to fly to the aerodrome. After one circuit the machine, which was flying very low, fell into the sea.

Squadron-Commander Philip Shepherd, R.N., explained to the jury that it had been ascertained that when flying over smooth water an aviator could not tell whether he was 10, 100, or 200 feet above the water. He saw the deceased flying, and thought he

intended to make a turn and come in towards the land, but before he could turn he hit the water, apparently through not being able to judge the height. An examination of the machine showed that there was no defect in it or in the engine.

Flight Sub-Lieut. Graham Donald stated that, seeing the machine in the water, he swam out 200 to 300 yards, and after a struggle succeeded in releasing the pilot's body from the seat.

Dr. Rainey attributed death to the injuries to Lieut. Shepherd's head, there being a large cut caused by contact with a wire.

A verdict of accidental death was returned, and Sub-Lieutenant Donald was commended for his gallant attempt at rescue.



WITH THE BELGIAN AVIATION SECTION.—A group of Belgian aviators at their base, several well-known pilots being easily recognised.

EDDIES.

SINCE I ventured, a week or two back, to draw attention to the brief training required by some of our embryo pilots, before qualifying for their "tickets," I have been inundated with claims for records in this line, or gentle reminders from friends of some of our flyers on active service, jogging my memory regarding their rapid initiation into the art. One friend, writing from Greece, puts in a plea for a one-time pupil, down there, to wit, Admiral Mark Kerr, who made his qualifying flights on a Sopwith biplane after working the dual control for 56 minutes, and making three solo flights aggregating 32 minutes, a total of 88 minutes in all, a very fine performance for man, machine and instructor, and it is of such stuff our admirals are made. My correspondent omits to mention who the latter was, but I have a strong suspicion that it was none other than our old friend Collyns Pizey, who was "lent" to the Greek Navy for the purpose of starting a school for pilots, being given a temporary commission as Capitaine de Freigate, and who has recently been gazetted a Flight Lieutenant in the Royal Naval Air Service.

x x x

Mr. P. A. Watson, who will be remembered as the designer and constructor of the Watson rocking-wing aeroplane, described in *FLIGHT* of May 15th, 1914, has recently qualified for a pilot's certificate at the L. and P. school at Hendon. Chatting about things in general the other day, he told me of some experiments which he had been carrying out with the L. and P. biplane, which have proved, to his satisfaction that the theory underlying the design of his own machine holds good for any other. It will be recalled that in the Watson machine no vertical rudder is fitted, steering being effected by tilting laterally the small plane mounted a short distance above the main plane. In order to see whether a machine fitted with the ordinary vertical rudder could be made to steer by simply banking her, Mr. Watson took one of the L. and P. biplanes up to about 600 feet. Holding his rudder central, he put on full left warp, and, as soon as the machine had banked over sufficiently, shifted the control lever back to the central position. The machine immediately commenced a left-hand turn, as Mr. Watson had anticipated. Later Mr. Watson explained his little experiment to Mr. Kelly of the Beatty school, who took the opportunity soon after of taking up one of the Wright machines and carried

out the same experiment, with equally convincing results, the machine being easily steered merely by banking whilst holding the rudder central.

x x x

Mr. Watson tells me that he is applying for a commission in the Royal Naval Air Service, so that further demonstrations of the rocking-wing machine, which, by the way, is now fitted with floats, for flying over water, will have to be postponed, but I hope that after the war he will go on with his idea. From the point of view of simplicity it certainly seems to have much to recommend it, and several pilots who have flown her, among others Mr. Summerfield, of Melton Mowbray, speak very highly of the ease with which she is handled.

x x x

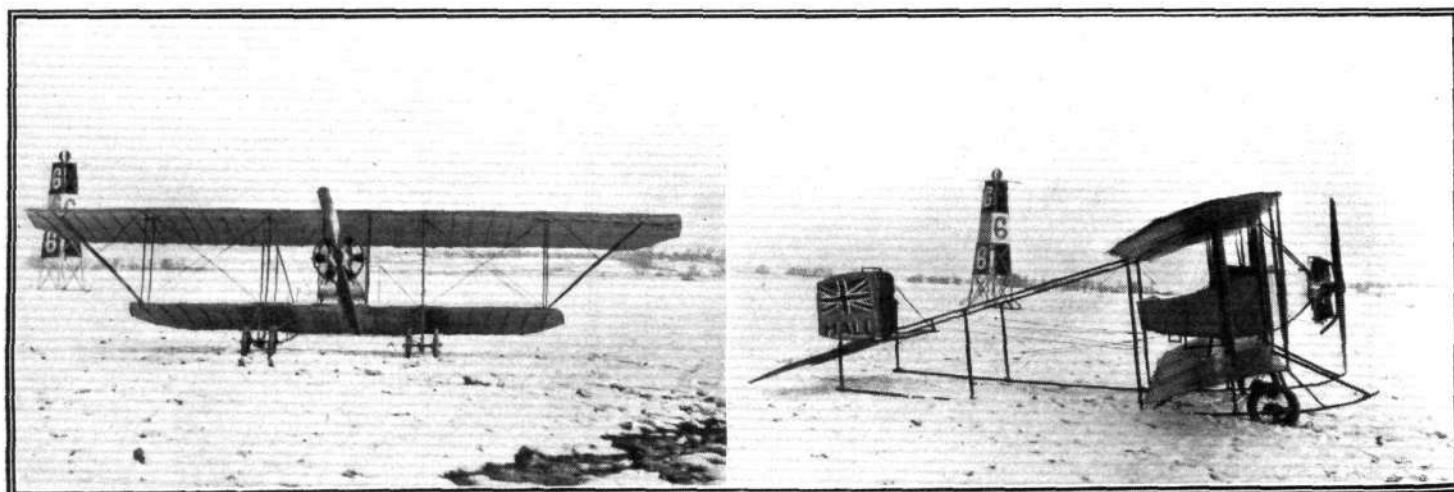
A correspondent in the Midlands tells me that Mr. S. Summerfield is at present testing a new monoplane which is designed to be automatically stable. Details of the new machine are lacking, but in general appearance it is said to be somewhat similar to the Dunne, although the means of control are entirely different. The engine fitted is also of new design, a five-cylinder two-stroke, which, I understand, has given surprisingly good results.

x x x

It has already been remarked what an extraordinary similarity there is between some of the stories sent home by war correspondents both in France and Russia, of the "deeds of daring" performed by aviators with the Allied armies. Some of the stories are being worked to death, for it seems that they have also to do duty in the enemy's country. Thus, one which has gone the rounds of the *Fatherland* says, that after the fighting near Metz, a German pilot and his observer were returning to their own lines after a reconnaissance, and when at a height of 800 metres the pilot was killed by a rifle bullet, and his observer, a lieutenant, had to take control. Owing to a motor defect, he had to make a landing inside our lines, where he was fired at by some of the troops. According to the German paper, the lieutenant shot one of our officers, and putting on the cap belonging to the fallen officer, succeeded in returning to his own lines, with only a few slight wounds.

x x x

Another story which is printed by a German paper, on the authority of an officer, also contains some details



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The new Hall School biplane, Caudron type, at Hendon, under the mantle of winter.

which seem to be familiar. "We had been carrying out a reconnaissance flight," he writes, "which had been quite successful in spite of the enemy's fire. We had been in the air over two hours, and were just returning to our own lines, when suddenly, while yet fifteen to twenty kilometres from our base, the motor began to run irregularly. One cylinder ceased firing altogether, and I had to come down. This I did in the flattest possible glide, but still did not succeed in reaching our own lines. A landing was made near a Belgian village. During the descent we had got our revolvers ready and as soon as we touched, both I and my observer jumped out of the machine revolvers in hand. A short inspection soon revealed the fact that the sparking plug of the front cylinder had sooted up, and would have to be replaced. To do this only occupied a space of about ten minutes, but even in that short time the inhabitants of the village came rushing out towards us, armed with guns. My observer secured his weapons and ran towards the band, which consisted of about thirty people. I joined him as soon as I had replaced the sparking plug, and we succeeded in seizing the mayor of the village. We threatened to shoot the man if any harm befell us. In the meantime, the motor had begun to hum again. My observer lifted the mayor, whose limbs were shaking as with St. Vitus' dance, into the machine, and a few seconds later our machine rolled along the ground. We got away without a single shot being fired at us, and landed ten minutes later at our destination, whence we sent the Belgian mayor home."

x x x

It will not have been forgotten that a large number of rumours were in circulation during the early part of the war, concerning Garros, one of the most persistent being that he had charged into a Zeppelin and been killed. These rumours, it will be remembered, were later contradicted, and Garros is, to the best of my knowledge,

still doing great services to the cause of the Allies. A friend in France sends the following possible explanation as to how the report of his death arose. The well-known pilot Garaix had been making flights on the Paul Schmitt biplane, on which he put up such remarkable performances previous to the outbreak of the war. On one of his reconnaissance flights a German shot exploded his petrol tank, destroying the aeroplane and killing the pilot. When German patrols arrived on the spot, they found on the body of the dead pilot a piece of a visiting card, on which were the letters "Gar," which was all that remained of the name "Garaix." The Germans therefore jumped to the conclusion that the pilot whom they brought down was Garros. This explanation appears to sound highly probable, and it seems to be further confirmed by reports in German papers to the effect that Garros had been killed, which were not corrected later in spite of the contradictions in the French journals.

x x x

According to a short notice in a German aeronautical journal, the German representatives of the British and Colonial Aeroplane Co. have changed the name of the firm, which is now known as the Halberstadter Flugzeugwerke. I prefer the original title considerably, and hope presently to see its use resumed.

x x x

Congratulations to Mr. J. H. Rose, who has, I understand, been appointed an instructor in the Royal Naval Air Service. Mr. Rose's excellent work at the Hall School has been so evident from the number of pupils who have successfully completed their course of training recently, that it is unnecessary to dwell upon it here. It is gratifying, however, to know that his exceptional abilities have been officially recognised, and his appointment should mean a further increase in the output of soundly-trained pilots for the R.N.S.A. "ÆOLUS."



Three-quarter view from behind of one of the latest fighting biplanes used by the French Aviation Corps. This machine is not, as might be supposed, a Voisin, but a Breguet fighting biplane of the engine-behind type. The gunner, it will be noticed, sits behind the pilot. Below the nacelle may be seen the bomb-dropping device. The engine is a Salmson-Canton Unné.

THE FLYING MACHINE: THE AEROFOIL IN THE LIGHT OF THEORY AND EXPERIMENT.

By F. W. LANCHESTER, M.Inst.C.E.

(Continued from page 182).

§ 5. *Consequences of the Cyclic Component. Resultant Stream Lines.*—Now the vortex motion, or, more correctly, cyclic motion round the aerofoil is under somewhat different conditions from those which obtain in the flank or trailing continuations; firstly, its core is solid and is subject to a powerful force or reaction, i.e., the load sustained, at right angles to the direction of flight; secondly, its extremities are co-terminous with and continuous with those of the flank vortices, so that there is no dissipation of the vortex energy; thirdly, the axis of the cyclic system around the aerofoil is at right angles to the superposed motion of translation (the line of flight) instead of being in line with it as in the

"core" (whether it be a filament, a plane, or whatsoever its form) at right angles to the direction of flight (at right angles to the superposed translation, in other words), and as shown in the figures this applied force is downwards, and in fact is actually downwards under the conditions of motion already deduced from the assumption of the continuity of the trailing vortices. This downward force applied from without is applied by gravity—it represents load sustained.

The matter may be put another way; the motions shown in Figs. 7, 8, 9, result from their nature in a lifting reaction on the filament, plane, or cylinder, and this in the actual problem definitely constitutes a lifting reaction on the aerofoil.

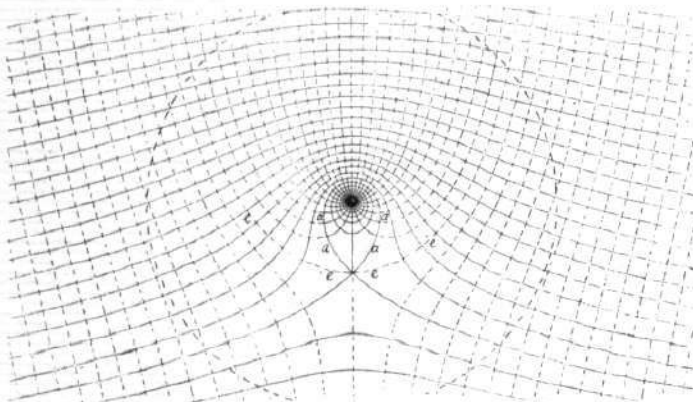


Fig. 7.

case of the trailing vortices. This latter condition results in an entire change in the geometrical form of the stream lines, sufficient almost to disguise the nature of the motion; thus, in the trailing vortices, the motions due to the vortex are in planes normal to the superposed translation, and so the translation and the circulatory motions are clearly separable to observation, whereas in the motion around the aerofoil the circulatory motion is in the same (vertical) plane as the translation, and the stream lines undergo a transformation which very greatly alters their appearance. This is just as motion in a circle when superposed on a translation may become either a screw or a curve of the cycloid family; in the former case, the circular character of the motion is quite self-evident, in the latter it may be disguised almost beyond recognition.

It is evidently a necessary step to learn to recognise and study the properties of cyclic motion superposed on translation in the

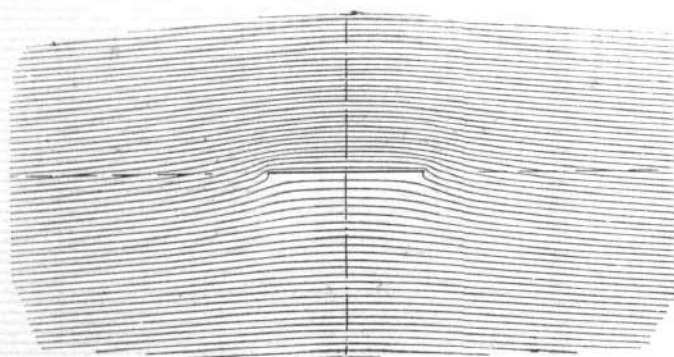


Fig. 8.

same plane. The solution is well known and constitutes a problem in two dimensions. Thus, in the simplest case, where the cyclic motion takes place round a filament or cylinder of negligible size, the solution is the same as that of a conductor carrying an electric current in a magnetic field, Fig. 7. Where the "core" of the cyclic system is a plane parallel to the direction of translation, the solution is given in Fig. 8, and Fig. 9 similarly represents the case of an elliptic cylinder.

Analysis shows that in all these cases, indeed in every similar case of cyclic superposition, the dynamic conditions can only be satisfied provided that a reaction be applied from without to the

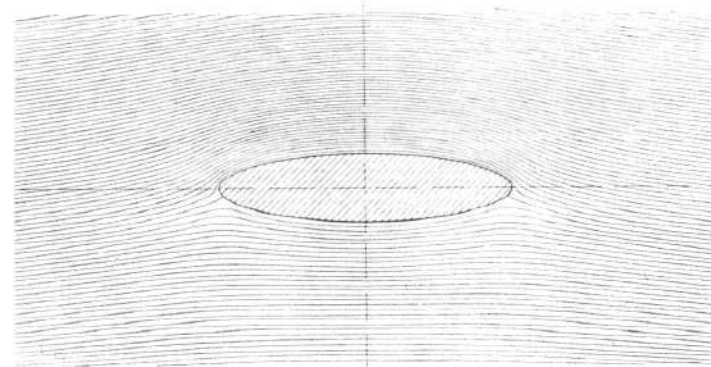


Fig. 9.

On examining the three figures given, we see that none of them represent types of flow which could in any real fluid such as air exist in their entirety; the stream lines undergo many sharp turns, which must in practice give rise to eddies and motion of the discontinuous type, just as takes place when a body of not properly "faired" form is drawn or propelled through air or water, and we are led to seek for indications of the features required in order that the sectional form of the aerofoil should be conformable to the lines of flow. One of the most important features to note is that the air in the region being entered by the aerofoil has an *upward motion or trend*: this betokens that in order to meet the air conformably the aerofoil must have a *dipping front edge*. Here we have at once an immediate and powerful conformation of the cyclic or vortex theory as set forth: it had long been known that the dipping front edge was a feature commonly found in the wings of birds before the present theory had been formulated, and certain experimenters, as Horatio Phillips in England and Lilienthal in Germany, had discovered its value in connection with artificial or mechanical flight. The explanations offered as alternative to that of the author, are either a "paraphrase" of the cyclic theory, or demonstrably unsound.

It is demonstrated subsequently in the present paper that vortex theory leads to direct quantitative results of value, but at present the exact interpretation is in some respects by no means easy or certain. It is difficult, for example, to define the precise rôle played by the cyclic motion round the aerofoil, which neither gains nor loses energy; yet we know it to be essential, for it is not possible to frame a régime which accords with experimental fact without taking it into account. ("Aerodynamics," § 160 *et seq.*) In a section of his work ("Aerodynamics," § 210), devoted to the screw propeller, the author has suggested that the cyclic component of the periphery (=around the wing) in effect constitutes a kind of dynamic tool or device by which the deeper layers of air are involved in a motion initially confined to the immediate neighbourhood of the aerofoil, the conception being that the direct action of the aerofoil concerned more particularly motions of the air which could be represented quantitatively by a layer of limited thickness, defined as the "sweep" of the foil, and represented roughly by the distance apart at which two aerofoils may be superposed without material interference; and that a more extended mass of the air, defined as that within the "peripheral area" or "peripheral zone" eventually takes up the downward momentum and in reality is the measure of the uniform motion equivalent of the total air movement to which the sustaining reaction is due.

More recently, the author has found new lines on which to explain the relation of the two portions of the vortex system,

namely, the portion surrounding the aerofoil and the two flank trailing continuations. The new point of view has the advantage of disclosing more exactly the working of the two parts of the system as a dynamic whole, and so is of interest both as leading to new results and as confirming the validity of the original work.

§ 6. *A New Hypothesis.*—Let us conceive an artificial atmosphere in which the constituent particles have restricted motion—they are



Fig. 10.

only permitted freedom in two dimensions; briefly, they are constrained to move only in planes at right angles to the line of flight. We cannot literally imagine space to be cut up into thin vertical slices by partitions, since this would restrict also the motion of the aerofoil, which must be permitted its ordinary freedom of movement, but with this reservation the kind of restraint which would be imposed by numerous vertical walls is identically that contemplated. It will be seen that in each vertical stratum the motion of the air will be in two dimensions, and the conditions of vortex motion will be more readily satisfied, since the terminations of the rotary cores cease to present any difficulty. Now as the aerofoil traverses the system of strata normally, it deals with the contents of each in turn, and under the conditions postulated the history of one will

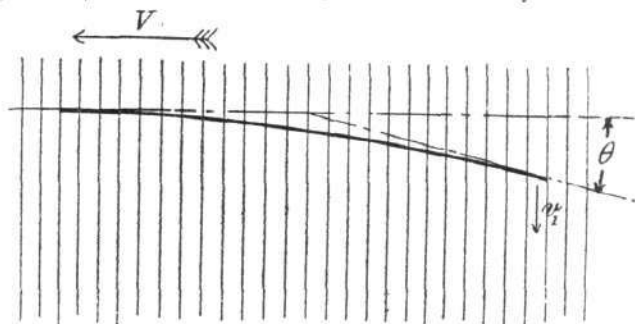


Fig. 11.

in due course be the history of all: thus, the problem is reduced to a case of two-dimensional vortex motion.

Now, in order to generate a vortex pair about any two points representing the vortex cores, x and x' , Fig. 10, hydrodynamic theory tells us that it is necessary to apply an impulse to the fluid along and normal to the line x, x' , as shown by the arrow heads. An "impulse" is, of course understood to be an infinite force applied for an infinitesimal time, but we suppose in reality the quantities to be finite, and we have to imagine a pressure difference for a certain brief interval of time

established by external agency at the line x, x' . But a pressure difference of uniform value will result in much more rapid motion in the vicinity of the terminal points x and x' than in the intervening region, this difference being in accordance with the well-established laws of cyclic motion. The essential character of the generating impulse is that the momentum represented by its action is constant per unit area.

Now the forces at x, x' are brought to bear by the action of the aerofoil, which we may represent in side elevation as in Fig. 11; and we may take it for the purposes of the moment to be of constant

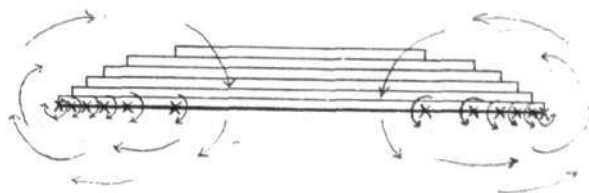


Fig. 12.

sectional form from end to end. Also, since we have now no possibility of disturbance in front of the advancing aerofoil, we may take it that its correct form of "entrance" is parallel to the line of motion—horizontal in the figure—and that in order to exert a uniform acceleration on the air during its passage, its form will be parabolic, or, as drawn, approximately a circular arc; the trail angle θ will then be the factor which determines the velocity (downward) imparted to the air, v^1 , which will be given by the expression $V \tan \theta$ where V is the velocity of flight. But this (under the conditions specified) will be constant throughout the length of the foil, and therefore will not give rise to a simple vortex pair; we may, however, suppose this constant velocity to represent a number of superposed force distributions each over a narrower and narrower base as indicated diagrammatically in Fig. 12, and so will give rise to a number of superposed cyclic systems whose core will be a vortex sheet or surface of gyration, and we recognise at once the whole system as already described and depicted in Figs. 4 and 5.

Under our restricted hypothesis it is clear that the fore-and-aft dimension of the aerofoil is a matter of no immediate importance; the greater the aspect ratio (*i.e.*, the less the fore-and-aft dimension), the more nearly impulsive will be the action, that is to say, the shorter the time and the higher the pressure system, but so long as the value of θ is constant the variation in the aspect ratio is of no effect on the velocity given to the fluid in its different parts. It is quite true that with great fore-and-aft length the aerofoil (lower aspect ratio) would give a greater eddy at its extremities, and in practice doubtless this effect is not negligible; but for the purpose of the present argument it can be ignored: it is referred to later.

(To be continued.)

✻ ✻ ✻ ✻ AIRCRAFT AND THE WAR.

Writing to the *Daily Telegraph* from Bale, under date of March 5th, Mr. A. Beaumont said:—

"Six French aeroplanes made a plucky flight over Alsace and the Rhine Valley yesterday, and returned without having come to grief, although the guns of every battery in the German lines seemed to have been at one time pointed at them. Three of them circled over St. Ludwig without apparently paying the slightest attention to the fire directed at them. The batteries of the Tüllingerhöhe, of the Brückenkopf, and even those of Istein, opened fire on them without success. They returned in the evening in the direction of Altkirch and Belfort. Some of these aeroplanes did not return to their quarters till long after night had fallen."

In a despatch dated North of France, March 8th, a *Morning Post* correspondent said:—

"Except over Verdun and Rheims the activities of the German aviators have been much reduced, whereas, on the contrary, the French aviators have been working with renewed vigour, and are rendering great service."

The *Daily Telegraph* correspondent at Petrograd, writing on March 12th, said:—

"During the past few days comparatively calm and clear weather has been favourable for air work, and dirigibles and aeroplanes on both sides have been very active. A large number of aerial scouts are always soaring over positions. About a score of small bombs

were thrown by German aviators into fortifications, but, as these have been proof against thousands of projectiles from the heaviest siege guns, naturally nothing was gained by this attack from above. In several districts the Germans have also flung down incendiary bombs, but as yet they have had no success with them. The clearness of the air and the observations of aviators have both favoured the fire of artillery, and that of the Germans has been specially busy along the whole front. There have been flung into the Russian lines a great variety of shells, ranging from those of an almost obsolete pattern to those of the very latest type, relying for their effectiveness largely on the diffusion of suffocating gases."

In a *communiqué* published in Berlin on March 11th there was the following:—

"In the western theatre of war British airmen dropped bombs on Menin."

Messages from Amsterdam on March 11th, stated that according to reports from the Belgian frontier a Parseval airship had fallen in a wood at Ghentbrugge, near Ghent, and was destroyed. Part of the crew are said to have been saved, two being injured.

In a despatch to the *Daily Chronicle* dated March 12th from the British General Headquarters, Mr. Philip Gibbs, describing an incident in the recent fighting, said:—

"All the time, while the batteries were at work, birds were singing the spring song in ecstatic lyrics of joyfulness, and they went

on far flights across a pale blue lake which was surrounded by black mountains of clouds. Another bird came out, but with a man above its wings. It was an English aeroplane on a journey of reconnaissance above the enemy's lines. I heard the loud hum of its engine, and watched how its white wings were made diaphanous by the glint of sun until it passed away into the cloud wrack.

"It was invisible to us now, but not so to the enemy. They had sighted it, and we saw their shrapnel searching the sky for it. The airman continued his journey in a wide circling flight, and we saw him coming back unscathed."

Mr. G. Valentine Williams, writing to the *Daily Mail* on the same subject, said:—

"Our guns seemed to be shelling the enemy from all over the winding valley, shelling him from well-chosen and well-concealed positions which are not even discernible to the German aircraft now becoming less and less frequent visitors over our lines."

"Presently a pure white biplane came soaring out to watch the effect of our bombardment. It flew very high. When it was over the valley I suddenly saw two puffs of smoke immediately below it. The Germans were shelling this 'eye of the artillery.' 'Snowballing a butterfly!' someone said beside me. But the snowballing stopped at that, for with a jerk of the elevating plane the airman mounted higher and disappeared from view behind a curtain of cloud."

Regarding the Zeppelin which is said to have been wrecked at Tirmont recently, the Havre correspondent of the *Matin* reported the following on the 13th inst.:—

"A rumour has been current that a Zeppelin had fallen in the neighbourhood of Tirmont, in consequence of a storm. According to information from Belgium, the true story is entirely different. The Zeppelin in question was brought down by Allied aeroplanes—two French and two English. Forty-one Germans were on board. Nine were found dead, and 29 so seriously injured that 12 died the following morning. It is superfluous to add that the incident caused a pleasant emotion in Belgium. The Germans, in their fury, arrested all those who had dared to photograph the debris."

A *Daily Mail* correspondent at Athens reported on Saturday:—

"British airmen after a superb flight have ascertained that the 'Queen Elizabeth,' by high-angle fire from the Gulf of Saros, has destroyed the Turkish barracks at Gallipoli and silenced two batteries in the interior of the straits."

The German *communiqué* issued on Saturday stated:—

"In the region of Neuve Chapelle, British aviators are displaying great activity."

Writing to the *Daily Mail* from the British General Headquarters in France on Sunday, regarding the Neuve Chapelle fight, Mr. G. Valentine Williams said:—

"Invaluable aid was lent by our airmen during the fighting. The courage and the skill they displayed in observation work and in actual participation in the assault on the German lines are beyond all praise. The destruction of the railway junctions at Courtrai and Menin was a particularly audacious piece of work. The airman responsible for the bombing of Menin descended with unparalleled daring to within 200 ft. of the station in order to make sure of his aim. The Germans were taken completely by surprise, and before they had recovered the British machine was off again. The airman who went to Courtrai managed to blow up a train standing in the station there. How completely the British success at Neuve Chapelle demoralised the Germans was demonstrated when they counter-attacked on the following day. Their attacks seemed badly organised and wanting in dash. Though our airmen reported that the Germans were hurrying up every available man to the front in motor-omnibuses and vehicles of all kinds, and it is known that they weakened their line at one part of the British front in order to reinforce their counter-attacks, their infantry seemed dispirited, and the attacks were easily beaten off by our artillery."

Writing from Geneva on March 14th, a *Daily Chronicle* correspondent said:—

"A despatch from Friedrichshafen states that a ninth Zeppelin has been constructed. Since the war at least five have been destroyed. The new airship has begun its trials on a lake preparatory to joining the fleet at Cuxhaven. It carries more powerful bombs than its predecessors, but has a smaller crew, skilled mechanics for the purpose being unobtainable in Germany owing to the recent disasters. Count Zeppelin himself is supervising the

trials. The largest coal depot on the Rhine, at Strassburg, which was set on fire fifteen days ago by bombs dropped by French aviators, is still burning. Some 4,000 tons of coal have been destroyed, while 20,000 tons lie in smouldering piles, the water thrown upon them by troops forming only a seething crust. If a strong wind arises the riverside portion of Strassburg will be endangered."

The Rotterdam correspondent of the *Daily Mail* wrote on Sunday:—

"The British successes at Neuve Chapelle and Epinette were largely due to the wonderful work of the Allied aeroplanes. Not a German gun was laid, not a body of troops moved without being detected by the eyes of the British Army. German officers in Bruges admit that their air service is hopelessly outclassed in numbers, daring, and intelligence by the Allies. From the sea to Ypres the sky is swept by aeroplanes practically every day, the British and French airmen competing in feats of skill and daring, while the German airmen will no longer face duels in the air, past contests having proved disastrous."

A *Daily Telegraph* correspondent at Mitylene, writing on Sunday regarding the Smyrna bombardment, said:—

"Later on a seaplane lowered from a French ship rose from the water and flew over the Two Brothers. Puffs of smoke were seen to rise from the batteries, denoting that the Turks were firing on the seaplane. The seaplane then turned eastward and flew off over the town of Smyrna for an hour, returning afterwards to its base, evidently unhurt."

Mr. G. Ward Price, writing to the *Daily Mail* from Dostris Island, Gulf of Smyrna, on Sunday, said:—

"The Turkish forts fired at a waterplane which was launched and flew over the Two Brothers peaks towards Smyrna, where it patrolled for about an hour—a new engine of war to this gulf, that has seen the weapons of many warriors from the Greeks to the Venetians, from the Saracens to the Knights of St. John."

The *Daily Telegraph* correspondent at Rotterdam, writing on Monday, said:—

"Desperate fighting continues not only in the area of the British advance around La Bassée, but also in Western Flanders. All arms are engaged, including naval guns off the coast and aeroplanes."

"The activity in the air is tremendous, and the German machines are constantly scouting in all directions. Last night a German airship came along the coast, apparently from the direction of the Scheldt, as it was reported as having been sighted at Terneuzen, on the Zeeland shore of the Scheldt. After scouting along the coast it passed into the interior of Belgium."

"Another factor that has led to demoralisation is the unexpected magnitude and success of the Allies' air raids. An officer taken prisoner near Dixmude admitted that the positions at Bruges and other places inland believed to be unknown and immune from aerial attack had suffered heavily from bombs. . . . Also that the German position mentioned as captured in the last *communiqué*, recording the Belgian success, was a windmill between Baeskerke and Dixmude. The Germans were so established here as to form a serious obstacle to the Allies' advance. Aerial attacks failed to destroy the mill, which, by means of reinforced concrete and other works, had been transformed into a veritable fortress. It was consequently decided to sap towards it and mine. . . ."

The special correspondent of the *Daily Telegraph* at Rotterdam, writing on Wednesday evening, said:—

"Yesterday morning another combined raid was made by the Allies' aerial squadron. A large number of machines flew along the coast, dropping bombs on military points at Ostend and Knocke. At the latter place a preliminary reconnaissance discovered the German batteries and defence works. Shortly after several machines appeared, and threw a large number of bombs in quick succession, causing explosions which proved that great damage had been done to the observed positions."

"At the same time the feat afforded a further proof that the Allies now have an unassailable superiority in the new arm. From an observation balloon at Zeebrugge the Germans detected the approach of the air squadron, and several machines were sent up in the hope of driving it off. The attempt was a complete failure, as the result was the exact reverse of that intended. Aviators were detached from the Allies' main squadron to deal with the Taubes. These were quite out-maneuvred, and forced to fly inland and descend. One machine chased by an Allies' aviator was compelled to fly for safety up the coast. It passed over Cadzand on the other side of the frontier, where it was fired on by a Dutch sentry."

Models

Edited by V. E. JOHNSON, M.A.

Professor Langley's Model Work.

(Continued from page 184.)

"FROM the very commencement of this long investigation the great difficulty was in keeping down the weight, for any of the models would probably have flown had they been built light enough, and in every case before the construction was completed the weight had so increased beyond the estimate that the model was too heavy to fly, and nothing but the most persistent resolution kept me in continuing attempts to reduce the weight after further reduction seemed impossible. Towards the close of the year [1893] I had, however, finally obtained a model with sufficient mechanical power, as it seemed to me, to fly, and I proceeded, after much thought as to where this flight should take place, to select a small houseboat to be moored somewhere in the Potomac, but the vicinity of Washington was out of the question, and no desirable place was found nearer than 30 miles below the city. It was because I knew the model might have to be launched in the face of the wind, which might be blowing in any direction, and because it evidently was at first desirable that it should alight on the water rather than on the land that the houseboat was selected as the place for the launch. Model No. 4 weighed between 9 and 10 lbs. and lifted 40 per cent. of this on the pendulum with 60 lbs. steam pressure [thereby showing, as we now know, that a pressure of 60 lb. per sq. in. is sufficient to fly a model once launched], a much greater percentage than was theoretically necessary for horizontal flight. And now the construction of a launched apparatus, dismissed for some years, was resumed. Nearly every form seemed to have been experimented with in the smaller models. Most of the difficulties were connected with the fact that it is necessary for a model, as it is for a soaring bird, to have a certain considerable initial velocity before it can advantageously use its own mechanism for flight, and the difficulties of imparting this initial velocity with safety are surprisingly great, and in the open air are beyond all anticipation. [We now know, of course, that if the model be fitted with light wheels, in the correct position, and be allowed to run along a level specially prepared surface, all these difficulties, practically speaking, disappear.] Here then commences another long story of delay and disappointment in these efforts to obtain a successful launch. To convey to the reader an idea of its difficulties a few extracts from the diary of the period are given. Each attempt involved a journey of 60 miles, 30 miles each way.

"November 18th, 1893. Having gone down to the boathouse preparatory to the first launch, in which the model was to be cast from a spring piece beneath, it was found impossible to hold it in

place on this before launching without its being prematurely torn from its support, although there was only a moderate breeze, and the party returned after a day's fruitless effort.

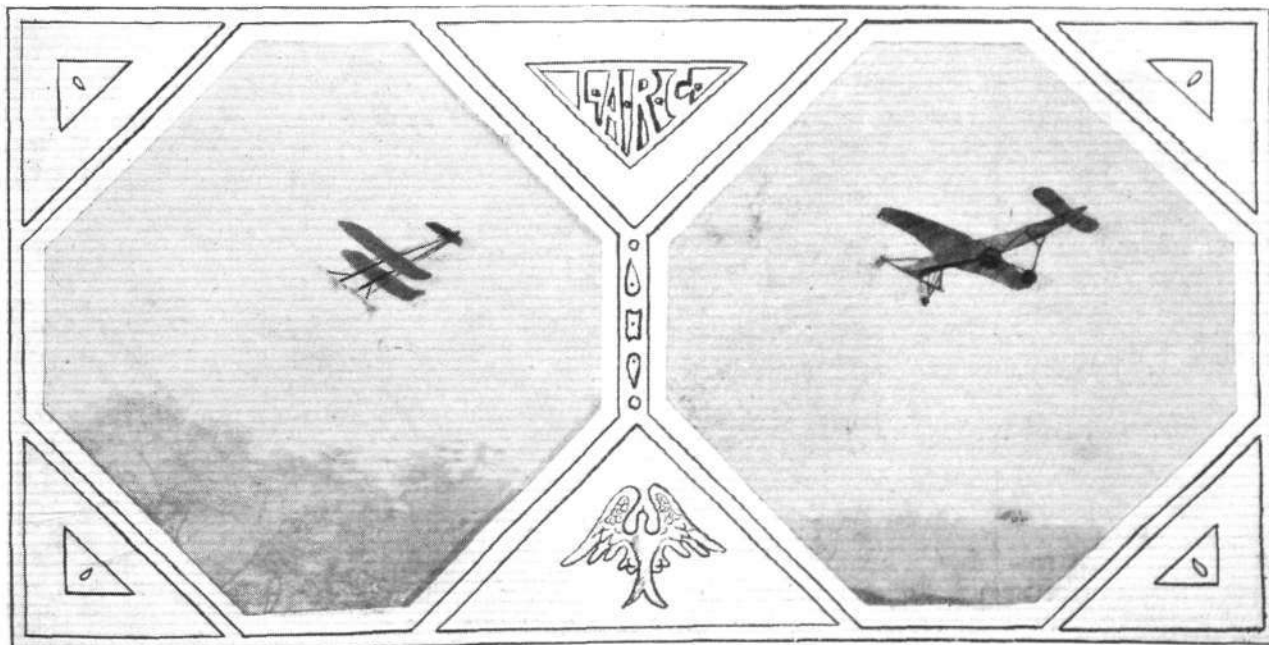
"Two days later a relative calm occurred in the afternoon of a second visit, when the model was mounted again, but though the wind was almost imperceptible it was sufficient to wrench it about so that at first nothing could be done, and when steam was got up the burning alcohol blew about so as to seriously injure the inflammable parts. Finally the engine being under full steam, the launch was attempted, but owing to the difficulties referred to and to a failure in the construction of the launching apparatus, the model was thrown down upon the boat, fortunately with but little damage.

"Whatever form of launching apparatus was used, it became evident at this time that the model must be firmly held up to the very moment of release and a device was arranged for clamping it to the launching apparatus.

"On November 24th another attempt was made to launch the model, which was rendered impossible by reason of a very moderate wind indeed.

"On November 27th a new apparatus was arranged, to merely drop the model over the water, with the hope that it would get up sufficient speed before reaching the surface to soar, but it was found that a very gentle intermittent breeze (probably not more than three to four miles an hour) was sufficient to make it impossible even to prepare to drop the model towards the water with safety. It is difficult to give an idea in a few words of the nature of the trouble, for unless one stands with the machine in the open air he can form no conception of what the difficulties are which are peculiar to practice in the open, and which do not present themselves to the constructor in the workshop, nor probably to the mind of the reader. December 1st, another failure; December 7th, another; December 11th, another; December 20th, another; December 21st, another. These did not all involve a separate journey, but five separate trips were made of a round distance of 60 miles each before the close of the season. It must be remembered that these attempts were in a district far from the conveniences of the workshop and under circumstances which took up a great deal of time, for some hours were spent on mounting the model on each occasion, and the year closed without its being really once launched into the air. It was not known how it would have behaved there, for there had not been a launch in nine trials, each one representing an amount of trouble and difficulty of which this narrative can give no adequate idea."

(To be continued.)



TWO EXCELLENT PHOTOGRAPHS OF MODELS IN FULL FLIGHT.—On the left Mr. T. W. Bennett's r.o.g. biplane. On the right Mr. G. H. Kilshaw's r.o.g. enclosed fuselage monoplane.

Liverpool Aero Research Club.

Mr. G. H. Kilshaw sends us the two excellent "snapshots" which we reproduce, of two models in full flight. Such photographs are always interesting, and are none too plentiful, as really good ones are by no means easy to obtain. "Both machines," says Mr. Kilshaw, "possess the well-known negative tips, by means of which most of our club models are stabilised."

Suggested Histories of Model Clubs.

We have received the following suggestion from Mr. F. J. Camm, Hon. Sec. of the Windsor Aero Club:—"Might I suggest that it would be a good idea for the secretaries of the more progressive model aero clubs to write a history of their clubs for publication in FLIGHT? It has been stated in your columns that much pioneer work has been lost through lack of record, and it would appear to be a great loss, that the pioneer work of many of the clubs who have done much to propagate the science should be relegated to the abyss of forgotten things. I refer, of course, to work other than the scanty details one gleans from the monthly reports. It would be interesting to know what other secretaries think of the matter."

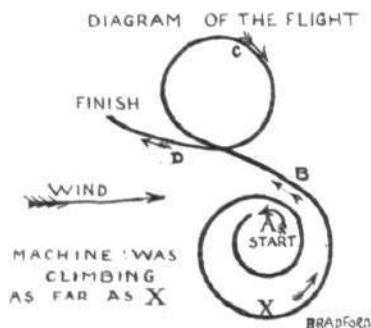
Referring to our correspondent's suggestion, there is much to be said in its favour, and the present time, in which far less than usual is going on in the model aeroplane world, is especially suitable for such a publication. Everything, of course, would depend on the manner in which the matter was carried out. We shall be pleased to hear what other secretaries have to say, and may we add, will they be good enough *in the common interest* to take the trouble to express an opinion on the matter? It is one which, like any other, requires *starting*. Perhaps Mr. Camm has the skeleton history, if not one already prepared. If he has and will send it along we shall be pleased to give it our very best consideration. Generally speaking, the further it went back the more interesting it would probably be, prior, *i.e.*, to the commencement of the model section in FLIGHT. Referring to the statement "that much pioneer work has been lost through lack of record," this is alas true of every art and science; the true pioneer, not the self-advertising quack, is often far too taken up with his actual work to find any time, even if he has the inclination, to set forth a record of the same; still more is this true in those cases in which he only meets with *partial* success. Such a fact cannot be too deeply deplored, because it so often happens that had such a record been published, there were those, who, by its aid, could have seen the why and wherefore of such failure, and by its aid have attained a final and lasting success. There is, of course, no need that the matter should be solely confined to club records; we can think straightaway of half a dozen pioneers who could or should be able to give a most interesting and valuable account of their early work. Some of them we know are far too busy at the present time, on work of far more vital national importance, but the matter is one which we have always had in our mind, and the present publication of the magnificent pioneer work of Professor Langley may be taken as the commencement of such a record.

Figure of 8 Flights.

"I enclose," writes Mr. A. W. Wood (Bradford), "a diagram of a flight of my twin-pusher monoplane, which is very similar to that of Mr. C. S. Mitchell's machine, described in a recent issue of FLIGHT."

"The explanation seems quite simple, namely, that the left-hand propeller has a bigger pitch than the right, though the difference may be only slight.

"When the machine was launched at A (see diagram), the right-hand propeller, having a small pitch, got up a bigger speed than the



¹Diagram of Flight of Mr. A. W. Wood's model.

other, and gave more power, thus turning the machine to the left. At B this propeller had slowed down sufficiently to give the same power as the other, at C it had slowed down so much that it was giving even less power than the other, while at D both propellers had stopped, and the machine finished its flight in a straight glide.

"At the time a gentle breeze was blowing, but insufficient to alter the model's path.

"The same effect might possibly be due to having different sizes or lengths of rubber for each propeller."

South-Western Aero Club.

Mr. P. W. Peel having resigned the secretaryship of this club on joining the Royal Flying Corps, Mr. J. W. Reid has been elected secretary.

R.A.F. War Distress Relief Fund.

A GENERAL meeting of those R.A.F. employees who had formed and maintained the above Fund, was held in the factory mess room on Thursday last week, for the purpose of receiving the audited accounts of the Fund for the nineteen weeks ending February 27th last.

The President, Mr. Mervyn O'Gorman, C.B., submitted the accounts, and expressed his pleasure at the amount of their contributions, which were to date £597 9s., or an average of £31 per week since the opening of the Fund. He also remarked on the careful distributions of the funds by their Committee. He had every reason to believe that this excellent weekly average would be maintained.

That the weekly contributions, which have been supplemented by subscriptions from the president and others, have, as Mr. O'Gorman stated, been carefully distributed, may be judged from the following summary of donations from this Fund :—

To the Farnborough Court Military Hospital, £101 15s.; Belgian Relief Fund, £54; Connaught Hospital, £53 13s.; Cambridge Hospital, £53 13s.; Soldiers and Sailors Families' Association, £33 3s.; St. John's Ambulance Association, £31 8s.; *Weekly Despatch* Tobacco Fund, £28; British Red Cross Society, £18; Royal Flying Corps Aid Fund, £8; Royal Naval Air Service Comforts Fund, £8; National Relief Fund, £15; Guildford Hospital, £4; Belgian Refugee Children's Xmas Fund, £3; Relief of Local Cases of Distress, £70 5s.

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